**3GPP TSG-RAN4 Meeting #111 *R4-2410250***

**Fukuoka City, Fukuoka, Japan, 20th May 2024 - 24th May 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **4527** | **rev** | **1** | **Current version:** | **17.13.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | CR to 38.133 Rel-17 CatF on PC5,6 RRM Test Configuration Parameters for RAN5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI17 | | | | |  | ***Date:*** | | | 2024-05-23 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Missing RRM test configuration parameters for PC5, 6 UEs are requested in RAN5 LS R5-237837. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Definition of Gain to SS-RSRP and CSI-RSRP measurement point for Rx Beam Peak angle of arrival for PC5 and PC6 * Definition of Minimum SSB\_RP for PC6 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | RAN5 tests cannot be specified. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | B.2.1.5, B.2.2, B.2.4.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This CR should be implemented after R4-2408654.  Contributes to the previous CR R4-2403553. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revision of R4-2408656. | | | | | | | | |

## <Start of Change #1>

### B.2.1.3 Derivation of Minimum SSB\_RP values for FR2

*Editor’s note:*

*- The Assumption for UE beams (fine or rough) in Annex A RRM test cases is defined based on power class 3, and unless otherwise stated also applies for other UE power classes*

#### B.2.1.3.1 Minimum SSB\_RP values for Rx Beam Peak angle of arrival

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on Reference sensitivity for the Operating band and for the UE power class, taking a baseline of UE Power class 3 in Band n260 with 50 MHz channel bandwidth.

Minimum SSB\_RP = Reference sensitivity PC3, n260, 50MHz +Y -10Log10(PRBRefsens x 12) – SNRRefsens + SSB Ês/Iot + ∆MBP,n

where:

Reference sensitivity PC3, n260, 50MHz is the reference sensitivity value in dBm specified for power class 3 in Band n260 for 50 MHz Channel bandwidth in Table 7.3.2.3-1 of TS 38.101-2 [19];

Y is the gain difference between fine and rough beams, which is defined in Table B.2.1.3.1-1;

T Table B.2.1.3.1-1: Gain difference Y between fine and rough beams, Rx beam peak direction

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Value “Y” in dB, for each UE power class | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| FFS | 9.0 | 7.0 | FFS | 15.5 | 15.5 | FFS |

PRBRefsens is NRB associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32;

12 is the number of subcarriers in a PRB;

SNRRefsens is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1 dB;

SSB Ês/Iot is the minimum value required by the UE to perform measurements, and is -6 dB for intra-frequency measurements and -4 dB for inter-frequency measurements. The only contribution to Iot is the UE internal noise;

∆MBP,n is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE power class 3 in Band n260 is (-109.5+∆MBP,n) dBm/120kHz for intra-frequency measurements and (-107.5+∆MBP,n) dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band\_Y) is used:

For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -109.5 dBm/120kHz + Refsens PC\_X, Band\_Y, 50MHz – Refsens PC3, n260, 50MHz + Y PC\_X – Y PC3 +∆MBP,n,

For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -107.5 dBm/120kHz + Refsens PC\_X, Band\_Y, 50MHz – Refsens PC3, n260, 50MHz + Y PC\_X – Y PC3 +∆MBP,n.

#### B.2.1.3.2 Minimum SSB\_RP values for angle of arrival within Spherical coverage

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on EIS spherical coverage for the Operating band and for the UE power class, taking a baseline of UE power class 3 in Band n260 with 50 MHz channel bandwidth.

Minimum SSB\_RP = EIS spherical coverage PC3, n260, 50MHz +Z -10Log10(PRBRefsens x 12) – SNRRefsens + SSB Ês/Iot + ∆MBS,n

where:

EIS spherical coverage PC3, n260, 50MHz is the EIS spherical coverage value in dBm specified for power class 3 in Band n260 for 50MHz Channel bandwidth in TS 38.101-2 [19] Table 7.3.4.3-1;

Z is the gain difference between fine and rough beams, and is defined in Table B.2.1.3.2-1;

Table B.2.1.3.2-1: Gain difference Z between fine and rough beams, Spherical coverage directions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Value “Z” in dB, for each UE power class | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| FFS | 9.0 | 7.0 | FFS | 15.5 | 15.5 | FFS |

PRBRefsens is NRB associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32;

12 is the number of subcarriers in a PRB;

SNRRefsens is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1 dB;

SSB Ês/Iot is the minimum value required by the UE to perform measurements, and is -6 dB for intra-frequency measurements and -4 dB for inter-frequency measurements. The only contribution to Iot is the UE internal noise;

∆MBS,n is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE power class 3 in Band n260 is (-96.9+∆MBS,n) dBm/120kHz for intra-frequency measurements and is (-94.9+∆MBS,n) dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band\_Y) is used:

For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -96.9 dBm/120kHz + EIS spherical coverage PC\_X, Band\_Y, 50MHz – EIS spherical coverage PC3, n260, 50MHz + Z PC\_X – Z PC3 +∆MBS,n

For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -94.9 dBm/120kHz + EIS spherical coverage PC\_X, Band\_Y, 50MHz – EIS spherical coverage PC3, n260, 50MHz + Z PC\_X – Z PC3 +∆MBS,n

## <Start of Change #1>

## <Start of Change #2>

### B.2.1.5 Gain to SS-RSRP and CSI-RSRP measurement point for FR2

#### B.2.1.5.1 Gain to SS-RSRP and CSI-RSRP measurement point for Rx Beam Peak angle of arrival

In clause 5.1.1 of TS 38.215 [4] SS-RSRP and CSI-RSRP is defined to be measured based on the combined signal from antenna elements corresponding to a given receiver branch. The reference point for requirement parameters from the UE perspective is the input of the UE antenna array. The gain “G” relates the combined signal from antenna elements corresponding to a given receiver branch to the reference point for requirement parameters.

The gain “G” affects absolute signal level values reported by the UE.

A diagram of a signal

Description automatically generated

**Figure B.2.1.5.1-1: Gain and Reference point for requirement parameters**

The gain range for each power class is specified in Table B.2.1.5.1-1.

Table B.2.1.5.1-1: UE gain G, Rx beam peak direction

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | UE Power class | | | | | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Minimum, dBi | FFS | FFS | -10 | FFS | -5 | -5 | FFS |
| Maximum, dBi | FFS | FFS | +20 | FFS | +44 | +44 | FFS |

Gain range in spherical coverage directions may be lower than in Rx beam peak direction, according to the difference between the EIS spherical coverage value specified in TS 38.101-2 [19] clause 7.3.4 and the Reference sensitivity level specified in TS 38.101-2 [19] clause 7.3.2.

#### B.2.1.5.2 Gain to SS-RSRP measurement point for different frequency

In any specific direction, the UE gain G may be different depending on frequencies. The gain “Ginter” affects relative signal level values reported by the UE when measuring between different frequencies and is specified in Table B.2.1.5.2-1 for each power class.

Table B.2.1.5.2-1: UE gain difference between inter-frequencies Ginter

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | UE Power class | | | | | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Maximum difference, dB | FFS | FFS | 3 | FFS | [3] | 3 | FFS |

#### B.2.1.5.3 Alignment of Rough beam to Rx beam Peak

The definition of Rx Beam Peak in TS 38.101-2 [19] clause 7.3.2 is based on Throughput at Reference sensitivity power level, and assumes use of Fine beams. In many RRM scenarios the UE can use Rough beams, but the largest Rough beam gain direction may not be aligned to the Fine beam Peak direction.

When the Rx Beam Peak is selected and defined based on Fine Beams, the rough beam gain in that direction may be lower than the largest rough beam gain in another direction within Spherical Coverage. The term “D” is the maximum allowed rough beam gain reduction, and is specified in Table B.2.1.5.3-1 for each power class.

Table B.2.1.5.3-1: Rough Beam gain reduction “D” in Rx Beam Peak direction

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | UE Power class | | | | | | | | | | | | |
|  | 1 | | 2 | | 3 | | 4 | | 5 | 6 | | 7 | |
| Maximum gain reduction, dB | FFS | | FFS | | 5.5 | | FFS | | 10 | 10 | | FFS | |

## <End Change #2>

## <Start of Change #3>

## B.2.2 Conditions for NR intra-frequency measurements

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.2-2 for FR2 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | NR operating band groups Note1 | Minimum SSB\_RP | | SSB Ês/Iot |
| dBm / SCSSSB | | dB |
| SCSSSB = 15 kHz | SCSSSB = 30 kHz |
| Conditions | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | ≥ -6 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 |
| NR\_TDD\_FR1\_C | -126 | -123 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. | | | | |

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Angle of arrival | | NR operating bands | | Minimum SSB\_RP Note 2, Note 3 | | | | | | | | | | | | | SSB Ês/Iot | |
|  |  | |  | | dBm / SCSSSB | | | | | | | | | | | | | dB | |
|  |  | |  | | SCSSSB = 120 kHz | | | | | | | | | | | | SCSSSB = 240 kHz |  | |
|  |  | |  | | UE Power class | | | | | | | | | | | | UE Power class |  | |
|  |  | |  | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 1, 2, 3, 4, 5, 6 |  | |
| Conditions | Rx Beam Peak | | n257 | | -128.3+Y1 | | -113.8 | | -112.1 | | -127.8+Y4 | | -123.4+Y5 | | -107.9 | | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 | |
|  |  | | n258 | | -128.3+Y1 | | -113.8 | | -112.1 | | -127.8+Y4 | | -123.6+Y5 | | -108.1 | |  |  | |
|  |  | | n259 | |  | |  | | -108.5 | |  | | -120.5+Y5 | |  | |  |  | |
|  |  | | n260 | | -125.3+Y1 | |  | | -109.5 | | -125.8+Y4 | |  | |  | |  |  | |
|  |  | | n261 | | -128.3+Y1 | | -113.8 | | -112.1 | | -127.8+Y4 | |  | | -107.9 | |  |  | |
| n262 | | -123.3+Y1 | | -108,6 | | -106.6 | | -121.8+Y4 | |  | |  | |
|  | Spherical coverage Note 1 | | n257 | | -120.3+Z1 | | -102.8 | | -101.2 | | -118.8+Z4 | | -115.4+Z5 | | -99.9 | | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 | |
|  |  | | n258 | | -120.3+Z1 | | -102.8 | | -101.2 | | -118.8+Z4 | | -115.6+Z5 | | -100.1 | |  |  | |
|  |  | | n259 | |  | |  | | -95.7 | |  | |  | |  | |  |  | |
|  |  | | n260 | | -117.3+Z1 | |  | | -96.9 | | -113.8+Z4 | |  | |  | |  |  | |
|  |  | | n261 | | -120.3+Z1 | | -102.8 | | -101.2 | | -118.8+Z4 | |  | | -99.9 | |  |  | |
| n262 | | -115.1+Z1 | | -96.7 | | -93.5 | | -109.7+Z4 | |  | |  | |
| Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.  Note 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.  Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ∆MBP,n and Spherical coverage values are increased by ∆MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. | | | | | | | | | | | | | | | | | | | | |

*Editor’s notes for Table B.2.2-2:*

*- The value of Y for power classes 1 and 4 is FFS, where Y1 and Y4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively.*

*- The value of Z for power classes 1 and 4 is FFS, where Z1 and Z4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively.*

## <End of Change #3>